Remarks

Thorough examination by the Examiner is noted and appreciated.

The claims have been amended to further clarify Applicants invention. No new matter has been added.

Support for the claim amendments are found in the original and previously presented claims, the Figures, and in Specification at:

Beginning at page 5, line 11:

"The **d.c. energy source 12 includes a high voltage charge carrier** 16 coupled in series with a power converter 18. The charge carrier 16 may include either **a battery pack having a plurality of battery cells connected with each other, an ultracapacitor for storing electrical energy, a flywheel or other device for storing electrical power, or a combination of these devices.** For illustration and sake of simplicity in explaining the invention herein, however, the charge carrier 16 will sometimes be referred to as a battery pack or battery. The power converter 18 is a conventional, bidirectional device that converts the power supplied by the charge carrier 16 into a form that is compatible with the requirements of the system loads 14. Specifically, the power converter converts the voltage and current supplied by the charge carrier 16 into levels that match the voltage on a parallel bus that supplies power to the system loads 14."

Beginning at page 7, line 31:

"The control method is carried out by **setting the charge carrier 16 power output**, based on the previous SOC level, to the following

$$P_{CC}(k) = (n_{CC}(k) * V_{FC}^{MAX}) / (2 * S * V_{FC}(k)) + C(k-1) - C_{NOM}$$

if the power required by the system loads 14 is less than the maximum power available from the fuel cell 10 and

$$P_{CC}(k) = -(P_{LOAD}(k) + P_{FC}^{MAX})$$

if the power required by the system loads 14 is equal to or greater than the maximum power available from the fuel cell 10 and the fuel cell is operating at its maximum power output. Simulation testing has shown that this control method considerably decreases the power supplied by the fuel cell 10 over time, when compared to the use of the charge carrier 16 only as an additional power source for fuel cell short falls, and as a sink for regenerative braking. This control strategy would therefore lead to a proportional increase in fuel economy."

Rejections Under 35 USC § 102

1. Claims 1, 2, and 5 stand rejected under 35 USC § 102(e) as being anticipated by Fields (US 2005/0048335).

Fields discloses a fuel cell stack connected to an energy storage device through a DC-DC converter (see Figure 1) where a voltage monitoring circuit is connected to the fuel cell and **a voltage regulating circuit controls output from the DC-DC converter to the output bus** (to which the energy storage device is also connected) (see Abstract; Figure 1). The method and operation of the device of Fields is designed **to operate the fuel cell as maximum power output at all times** to reduce the time required to recharge the battery (paragraphs 006, 0016). The output voltage of the fuel cell is adjusted to the output voltage of the battery (via the voltage regulating circuit regulating the DC-DC converter between the fuel cell and the battery (and output bus)) (paragraph 0008). Fields

teaches that the operating efficiency of the fuel cell is subordinated (of secondary concern) to the stated objective of the invention of **providing maximum power (at all times) from the fuel cell** (paragraph 0009).

Fields discloses that by **providing maximum power** to the load and **controlling the output voltage of the DC-DC converter to correspond to maximum fuel cell power output** and that the load **is automatically shared** (by virtue of parallel connection) between the fuel cell stack and the battery (energy storage device) **such that the battery is maintained at maximum possible charge level** (paragraph 0034, 0036). That is, the DC-DC converter output voltage is adjusted to maintain the fuel cell at maximum power level in response to the load where the output voltage from the DC-DC converter (fuel cell at maximum power) is automatically (by virtue of parallel connection to the output bus) distributed between the output bus and the battery.

Fields discloses further discloses that **under loading conditions that equal the fuel cell power output capability** that **all the system power is supplied by the fuel cell** (stack) (by virtue of **zero** current going into or out of the battery) (paragraph 0041).

Thus, Fields fails to disclose several elements of Applicants invention including those elements in **bold type:**

"A method of controlling the operation of hybrid power system having a fuel cell and a charge carrier comprising a DC electrical energy source, said fuel cell and said DC

electrical energy source for supplying power to a load, comprising the steps of:

(A) **determining a state of charge of the charge carrier;**

(B) **setting a power output of the charge carrier to output power at a first value** if the power required by the load **is less than the maximum power output available to be supplied from the fuel cell wherein the fuel cell is operating at less than said maximum power output;** and,

(C) **setting the power output of the charge carrier to output power at a second value** if the power required by the **load is equal to or greater** than the **maximum power output available to be supplied from the fuel cell** wherein the fuel cell is operating at said maximum power output **and said first and second value are greater than zero."**

Thus, Fields nowhere discloses or suggests **setting a power output** of the charge carrier, or that the **fuel cell is operating at less than said maximum power output,** but rather discloses **setting the voltage output of the DC-DC converter** so that the **fuel cell operates at maximum voltage/power output** and where the output voltage of the battery (charge carrier) is determined by the load (automatically set by virtue of a parallel connection to the load) and further, **where the battery provides no voltage output where the load requirements equal the maximum power/voltage output of the fuel cell.**

Thus, Fields is clearly insufficient to anticipate Applicants invention.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

"The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Rejections Under 35 USC § 103

2. Claim 3 stands rejected under 35 USC § 103(a) as being unpatentable over Fields (US 2005/0048335) in view of Sugiura (US 2003/0118876) further in view of Hochgraf (US 2003/0044658).

Applicants reiterate the comments made above with respect to Fields.

Even assuming arguendo a proper motivation for modifying Fields with the teachings of Hochgraf, the fact that Hochgraf disclose a fuel cell connected in parallel to a load and where the fuel cell voltage is controlled to make in compatible with the voltage characteristics of the energy storage device (battery) (i.e., no power conversion) (paragraph 006) as a

function of the load current and SOC of the battery and where the SOC of the battery is operates over a desired range including up to 100 % SOC where the load current is supplied entirely by the fuel cell (paragraph 0050), does not further help Examiner in producing Applicants invention.

Moreover, modifying Fields to have the battery operate at a level less that 100% SOC (maximum charge) would **change the principle of operation** of the method of Fields (**having battery maintained at maximum charge state**) and make the method of Fields **unsuitable for its intended purpose** (**having battery maintained at maximum charge state**), and still would not produce Applicants invention.

It is noted that Examiner cites but does not apply Sugiura.

"If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious." *In re Ratti, 270 F.2d 810, 123, USPQ 349 (CCPA 1959).*

"If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification." *In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).*

"**First**, there must be some **suggestion or motivation**, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. **Second**, there must be a **reasonable expectation of success**. **Finally**, the prior art reference (or references when combined) **must teach or suggest all the claim limitations**. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).*

3. Claims 4 and 6 stand rejected under 35 USC § 103(a) as being unpatentable over Fields (US 2005/0048335) in view of Sugiura (US 2003/0118876) as evidenced by Ulmer (US 2005/0069740).

Applicants reiterate the comments made above with respect to Fields.

The fact that Sugiura teaches that a secondary battery supplies power to a load when the SOC of the secondary battery **is sufficiently large and the size of the load exceeds or equals a predetermined upper limit of the fuel cell output** (see paragraph 0047) and where the output voltage of the **fuel cell correspondingly decreases** as the secondary battery output voltage increases, and where the fuel cell supplies no power to the load (only the battery supplies power to the load) when

the load requirement is low (see Abstract), does not further help Examiner in producing Applicants invention.

The fact that Ulmer teaches a definition and equation for fuel cell voltage does not help Examiner. Examiner is further mistaken in asserting that the power output of the battery in Fields depends on the fuel cell voltage. Rather, the output voltage of the battery depends on the load requirements while the voltage of the DC-DC converter is set to maintain the fuel cell at maximum operating voltage regardless of the load requirements. (i.e., the battery is charged when the load requirements are less that supplied by the fuel cell; zero output or input to the battery when the load requirements are equal to the maximum output supplied by the fuel cell; and battery output determined by the excess load requirements when the load requirements exceed the maximum amount supplied by the fuel cell).

Moreover, modifying Fields to have the fuel cell operate at less than maximum power according to the teachings of Sugiura would **change the principle of operation** of the method of Fields (**having the fuel cell operate at maximum power**) and make the method of Fields **unsuitable for its intended purpose** (**having the fuel cell operate at maximum power**), and still would not produce Applicants invention.

"If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious." *In re Ratti, 270 F.2d 810, 123, USPQ 349 (CCPA 1959).*

"If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification." *In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).*

"**First**, there must be some **suggestion or motivation**, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. **Second**, there must be a **reasonable expectation of success**. **Finally**, the prior art reference (or references when combined) **must teach or suggest all the claim limitations**. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).*

Conclusion

The cited references fail to produce or suggest Applicants invention, and are therefore insufficient to make out a *prima facie* case of anticipation or obviousness.

Applicants have amended the claims to further clarify their invention and define over the prior art.

Based on the foregoing, Applicants respectfully request favorable consideration of Applicants claims and submit that Applicants Claims are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.

In the event that the present invention as claimed is not in a condition for allowance for any other reasons, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

Respectfully submitted,
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